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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/767,107	01/28/2004	Ray R. Eshraghi	4172-121	4423

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INTELLECTUAL PROPERTY / TECHNOLOGY LAW
PO BOX 14329
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EXAMINER	
CHUO, TONY SHENG HSIANG	
ART UNIT	**PAPER NUMBER**
1795	
MAIL DATE	**DELIVERY MODE**
04/09/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/767,107	ESHRAGHI ET AL.	
	Examiner	Art Unit	
	Tony Chuo	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 March 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-14,16-39,41-47,49 and 50* is/are pending in the application.

4a) Of the above claim(s) *2-9,11-14,26,31-39 and 41-47* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,10,16-25,27-30,49 and 50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 March 2004* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 3/12/08 has been entered.

Response to Amendment

2. Claims 1-14, 16-39, 41-47, 49, and 50 are currently pending. Claims 15, 40, and 48 are cancelled. Claims 2-9, 11-14, 26, 31-39, and 41-47 are withdrawn from further consideration as being drawn to a non-elected invention. The amended claims do overcome the previously stated 103 rejection. However, upon further consideration, claims 1, 10, 16-25, 27-30, 49, and 50 are rejected under the following new 103 rejections.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 10, 16-25, 27, and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amendola et al (US 6534033) in view of Kuespert (US 6228146), and further in view of Nemser et al (US 5876604).

The Amendola reference discloses a hydrogen generation system "100" comprising: a reservoir "120" for containment of a $NaBH_4$ solution (carrier material) "140" that is adapted to hold a volume of $NaBH_4$ solution in isolation from an exterior environment of the reservoir and a reaction chamber "180" having a hydrogen generation catalyst system "170" (See column 13 line 62 to column 14 line 3 and Figure 9). It also discloses a housing "120" comprising a gas collection compartment "130" and a gas storage compartment "140" (See Figure 9). It also discloses a $NaBH_4$ solution that has a concentration ranging from 5 to 25 wt% $NaBH_4$ and 1 to 10 wt% NaOH (See Figure 1). It also discloses water generated from a hydrogen consuming device such as a fuel cell that is added to the borohydride solution (See column 4, lines 30-48). It also discloses an inlet "200" for the $NaBH_4$ solution and an outlet "160" for the $NaBH_4$ solution (See Figure 9).

However, Amendola et al does not expressly teach a plurality of microtubular elements disposed in the housing, having one or more open ends in fluid communication with either the gas collection compartment or the gas storage compartment and extending from the compartment with which it is in fluid communication and into the other compartment; wherein each of the microtubular elements comprises a tubular wall permeable to a target gas and defining a bore side

and a shell side, and wherein the bore side of each of the microtubular elements is sealed from the shell side thereof; a seal, which together with the tubular walls, sealingly isolates the gas collection compartment from the gas storage compartment; a carrier material that is disposed in and stored in the housing at either the bore sides or the shell sides of the microtubular elements; carrier material for the target gas that is disposed at the shell sides of the microtubular elements; a seal that comprises one or more potting members at or proximate to the one or more open ends of the microtubular elements on the bore sides of the microtubular elements and providing a leak-tight seal, wherein one or more potting members, the tubular walls, and the housing define: at least one liquid compartment for holding the liquid carrier material and at least one hydrogen collection compartment separated from the liquid compartment in a leak-tight manner, wherein the microtubular elements extend from the liquid compartment to the hydrogen collection compartment, so that the shell sides of the microtubular elements at least partially contact the liquid carrier material in the liquid compartment, and that the bore sides of the microtubular elements are in fluid communication with the hydrogen collection compartment, and wherein the housing comprises at least one hydrogen outlet connected to the hydrogen collection compartment for dispensing hydrogen gas therefrom; and tubular walls of the microtubular elements that comprise a membrane material that is gas-permeable but liquid-impermeable, wherein the membrane material comprises a microporous, hydrophobic polymeric material.

The Kuespert reference discloses a gas recovery device “10” comprising: a) a shell (housing) “22” comprising a gas collection compartment “26” and a gas storage

compartment (not labeled); b) a plurality of permeation units “30” that are tubular elements disposed in the shell i) having one or more open ends in fluid communication with the gas collection compartment and ii) extending from the gas collection compartment into the gas storage compartment, wherein each of the permeation unit comprises a tubular wall permeable to a target gas and defining a bore side and a shell side; c) an epoxy resin which together with the tubular walls, sealingly isolates the gas collection compartment from the gas storage compartment by potting the ends of tubes “30”; and d) a carrier material is disposed in the gas storage compartment on the shell side of the permeation units (See column 4, lines 5-36 and Figure 2). It also discloses permeation units that are gas permeable, liquid impermeable tubes of expanded microporous polytetrafluoroethylene that has outer diameters of about 3 mm (See column 6, lines 58-66).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola hydrogen generation system to include a plurality of microtubular elements disposed in the housing, having one or more open ends in fluid communication with either the gas collection compartment or the gas storage compartment and extending from the compartment with which it is in fluid communication and into the other compartment; wherein each of the microtubular elements comprises a tubular wall permeable to a target gas and defining a bore side and a shell side, and wherein the bore side of each of the microtubular elements is sealed from the shell side thereof; a seal, which together with the tubular walls, sealingly isolates the gas collection compartment from the gas storage compartment; a

carrier material that is disposed in and stored in the housing at either the bore sides or the shell sides of the microtubular elements; carrier material for the target gas that is disposed at the shell sides of the microtubular elements; a seal that comprises one or more potting members at or proximate to the one or more open ends of the microtubular elements on the bore sides of the microtubular elements and providing a leak-tight seal, wherein one or more potting members, the tubular walls, and the housing define: at least one liquid compartment for holding the liquid carrier material and at least one hydrogen collection compartment separated from the liquid compartment in a leak-tight manner, wherein the microtubular elements extend from the liquid compartment to the hydrogen collection compartment, so that the shell sides of the microtubular elements at least partially contact the liquid carrier material in the liquid compartment, and that the bore sides of the microtubular elements are in fluid communication with the hydrogen collection compartment, and wherein the housing comprises at least one hydrogen outlet connected to the hydrogen collection compartment for dispensing hydrogen gas therefrom; and tubular walls of the microtubular elements that comprise a membrane material that is gas-permeable but liquid-impermeable, wherein the membrane material comprises a microporous, hydrophobic polymeric material in order to efficiency of gas generation by increasing the surface area of the gas/liquid interface.

Examiner's note: The Kuespert reference is relevant to the Amendola reference and the applicant's field of endeavor because it solve the same problem of separating gas from a liquid carrier material.

However, Amendola et al as modified by Kuespert does not expressly teach microtubular elements that have an outer diameter in a range of from 10 micrometer to 1 millimeter, wherein the tubular walls of the microtubular elements comprise a first layer of structural material that is gas and liquid permeable and a second layer that is gas permeable but liquid impermeable. The Nemser reference discloses hollow fibers (gas and liquid permeable) coated with a thin layer of PDD copolymer (gas permeable/liquid impermeable) that have an outer diameter of 800 μm, wherein the coated hollow fibers are used to degasify a liquid (See column 5, lines 19-22, column 8, lines 4-6, column 9, line 5, and column 10, lines 31-32).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola/Kuespert hydrogen generation system to include microtubular elements that have an outer diameter in a range of from 10 micrometer to 1 millimeter, wherein the tubular walls of the microtubular elements comprise a first layer of structural material that is gas and liquid permeable and a second layer that is gas permeable but liquid impermeable in order to maximize the rate of gas transmission through the membrane, to maximize gas flux, and to increase the surface area available for gas transfer by utilizing a larger number of microtubular elements with a smaller diameter (See column 6 lines 35-36).

5. Claims 29, 30, 49, and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Amendola et al (US 6534033) in view of Kuespert (US 6228146) and Nemser et al (US 5876604) as applied to claims 1, 10, 16-18, and 22 above, and further in view of Hockaday et al (US 2001/0045364).

However, Amendola et al as modified by Kuespert and Nemser et al does not expressly teach each of the tubular walls of the microtubular elements that comprises a first layer of a catalyst material, a second layer of a membrane material that is gas permeable but liquid impermeable, and third layer of structural material that is gas and liquid permeable; or tubular wall of each microtubular element that is impregnated with a catalyst material and has a coating of a membrane material that is gas permeable but liquid impermeable on an inner surface. The Hockaday reference discloses production of hydrogen that is initiated by a catalyst coated surface "5" that is attached to a hydrophobic porous membrane "1" (See paragraph [0098]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Amendola/Kuespert/Nemser hydrogen generation system to include each of the tubular walls of the microtubular elements that comprises a first layer of a catalyst material, a second layer of a membrane material that is gas permeable but liquid impermeable, and third layer of structural material that is gas and liquid permeable; or tubular wall of each microtubular element that is impregnated with a catalyst material and has a coating of a membrane material that is gas permeable but liquid impermeable on an inner surface in order to utilize a catalytic surface to more efficiently deliver a controlled hydrogen stream to portable applications.

Response to Arguments

6. Applicant's arguments filed 3/12/08 have been fully considered but they are not persuasive.

The applicant argues that there is no explanation of the manner in which implementation of the hypothetical modification would be made. The applicant further argues that there is no identification of how the deployment of permeation tubes in Amendola would achieve a better result than is achieved by Amendola alone.

The examiner contends that one skilled in the art would know how to modify the Amendola reservoir to include permeation tubes inside the $NaBH_4$ solution which is gas storage compartment. Both the Amendola reference and the Kuespert reference disclose a gas collection compartment and a gas storage compartment in the housing. Since Kuespert teaches disposing the permeation tubes in the gas storage compartment, one skilled in the art would know that the permeation tubes should also be disposed in the Amendola gas storage compartment. In addition, one skilled in the art would also know that the gas storage compartment and the gas collection compartment in the Amendola reservoir need to be isolated from each other in order to increase the flexibility of the Amendola hydrogen generation system. For example, if the Amendola system was oriented in a different configuration such as sideways or upside down, the system would not function. However, if the Amendola reservoir was modified by adding a seal to isolate the gas storage compartment from the gas collection compartment as taught by Kuespert, then the Amendola system can oriented in any configuration. Therefore, there is a clear advantage to isolating the gas storage compartment from the gas collection compartment. In addition, the Kuespert reference also discloses that “Preferably an ordered pattern is designed to provide the largest number of permeation unit tubes in the device consistent with the minimum spacing

dimensions" and "for any given length of the permeation unit tube, the total surface area of permeation units available for gas transfer is maximized". Therefore, there is a clear advantage to including a large number permeation tubes in the Amendola system which is to maximize the total surface area available for gas transfer, thereby increasing the efficiency of separating the gas from the liquid solution.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571)272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC

/Jonathan Crepeau/
Primary Examiner, Art Unit 1795